

IN THE CLAIMS

Claims 2-3 and 13-17 have previously been cancelled without prejudice.

Please amend claims 1, 9, 11, 22-25, and 31.

Please enter the pending claims as follows:

1. (Currently Amended) An apparatus for inducing chemical etching lacking an ion column and comprising:

a holder to mount a substrate;

a stage disposed below said holder to position said holder in a chamber;

an imaging system to locate an opaque defect on said substrate, said imaging system disposed vertically above said holder and substrate, said imaging system comprising a first electron column, said first electron column to direct a first set of electrons towards over an said opaque defect on said substrate;

a gas delivery system disposed at a first angle over said holder to dispense a reactant gas towards said opaque defect; and

an electron scanning delivery system disposed at a second angle over said holder to induce chemical etching of said opaque defect by said reactant gas without damaging underlying layers, said electron scanning delivery system comprising a second electron column, said second electron column to direct a second set of electrons towards said reactant gas opaque defect.

2. – 3. (Cancelled)

4. (Original) The apparatus of claim 1 wherein said substrate comprises a transmissive DUV mask.
5. (Previously Presented) The apparatus of claim 4 wherein said opaque defect comprises chrome and said reactant gas comprises chlorine and oxygen.
6. (Original) The apparatus of claim 1 wherein said substrate comprises a reflective EUV mask.
7. (Previously Presented) The apparatus of claim 6 wherein said opaque defect comprises an absorber and said reactant gas comprises Xenon Fluoride (XeF_2).
8. (Original) The apparatus of claim 1 wherein said opaque defect comprises Carbon and said reactant gas comprises water vapor or oxygen.
9. (Currently Amended) The apparatus of claim 1 further comprising a focusing system to highly focus said ~~second set of~~ electrons on said opaque defect.
10. (Previously Presented) The apparatus of claim 1 further comprising a computer to control dwell time and scan rate of said electron scanning delivery system.

11. (Currently Amended) The apparatus of claim 1 further comprising an acceleration system to provide a low acceleration voltage for said ~~second set of~~ electrons.
12. (Previously Presented) The apparatus of claim 1 further comprising a computer to control refresh time and retrace time of said electron scanning delivery system.
13. - 17. (Cancelled)
18. (Previously Presented) The apparatus of claim 1 wherein said gas delivery system is further to dispense a carrier gas towards said opaque defect.
19. (Previously Presented) The apparatus of claim 1 wherein said gas delivery system is to dispense said reactant gas with an angular dispersion of 5-25 degrees.
20. (Previously Presented) The apparatus of claim 1 wherein said reactant gas is to adsorb to said opaque defect and is to become disassociated.
21. (Previously Presented) The apparatus of claim 1 wherein said chamber comprises a pressure of about 0.500-10.000 milliTorr (mT) locally over said opaque defect.

22. (Currently Amended) The apparatus of claim 1 wherein said ~~second set of~~ electrons ~~is to~~ form a beam comprising a current of about 0.050-1.000 nanoAmperes (nA).

23. (Currently Amended) The apparatus of claim 1 wherein said ~~second set of~~ electrons ~~is to~~ form a beam comprising a tail diameter of about 5-125 nm.

24. (Currently Amended) The apparatus of claim 1 wherein said ~~second set of~~ electrons ~~is to~~ comprise a range of 0.3-3.0 keV.

25. (Currently Amended) An apparatus for repairing an opaque defect on a mask without ion implantation or knock-on of atoms lacking an ion column and comprising:

a chamber;
a stage disposed in said chamber, ~~said stage to move in different directions;~~
a holder positioned disposed over in said chamber by said stage;
a mask disposed over mounted on said holder;
an opaque defect disposed on said mask;
an imaging system for said chamber, said imaging system disposed directly above said opaque defect, said imaging system to locate said opaque defect;
a gas delivery system disposed at a first angle over said opaque defect for said chamber;

a gas ~~dispensed by said gas delivery system towards~~ disposed over
said opaque defect;

an electron scanning delivery system disposed at a second angle over
said opaque defect for said chamber;

electrons directed by said electron scanning delivery system towards
disposed over said opaque defect, said electrons to induce said gas to etch said
opaque defect without damaging underlying layers; and

a pumping system disposed in said chamber to evacuate volatile
byproducts of said etch.

26. (Previously Presented) The apparatus of claim 25 wherein said electrons
comprise a range of 0.3-3.0 keV.

27. (Previously Presented) The apparatus of claim 25 wherein said electron
scanning delivery system further comprises focusing controls.

28. (Previously Presented) The apparatus of claim 25 wherein said electron
scanning delivery system further comprises focusing and scanning controls that are
more sophisticated than in an SEM.

29. (Previously Presented) The apparatus of claim 25 wherein said gas comprises
water or oxygen.

30. (Previously Presented) The apparatus of claim 25 wherein said gas comprises Xenon Fluoride (XeF₂).

31. (Currently Amended) A mask repair system An apparatus lacking an ion column and comprising:

a chamber, said chamber to hold a mask;

an imaging system for said chamber, said imaging system disposed in said chamber directly over said mask, said imaging system to locate an opaque defect on the said mask;

a gas delivery system disposed in for said chamber, said gas delivery system to dispense one or more gases from reservoirs through nozzles towards said opaque defect; and

an electron scanning delivery system disposed in for said chamber, said electron scanning delivery system to provide a highly focused beam of direct electrons to interact with said one or more gases over towards said opaque defect, said electrons to induce chemical etching of said opaque defect by said one or more gases without damaging underlying layers.

32. (Previously Presented) The apparatus of claim 31 wherein said electrons comprise an acceleration voltage of about 1.0 keV or less.

33. (Previously Presented) The apparatus of claim 31 wherein said chemical etching is reaction-limited and not mass transfer-limited.